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Clinical, Radiological Profile and Bronchoscopic Assessment of Non-Resolving Pneumonia Patients in a Tertiary Care Hospital – A Cross-Sectional Study

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ABSTRACT

Introduction

Community-Acquired Pneumonia (CAP) is one among many acute medical conditions that require hospitalisation. Majority of patients with CAP respond well to standard antimicrobial therapy while a minority (non-resolving pneumonia) fail to respond requiring further treatment. This study focuses on the clinical, radiological profile and bronchoscopic assessment of non-resolving pneumonia patients. The study also analyses the diagnostic yield of video bronchoscopy.

Methods

A cross-sectional study conducted among patients admitted with non-resolving pneumonia in a tertiary care centre in the time period from August 2015 to July 2018. A total 55 patients satisfying the inclusion criteria were enrolled in the study. Clinical history, radiological assessment and video bronchoscopy were done for all patients. The variables were presented as frequency tables using SPSS-17.

Results

Among the study participants, 44 patients were males while 11 were females. The majority belonged to the age group 51-60 years (38.2%). The most common clinical symptom and auscultatory finding were cough with expectoration (54%) and crackles (80%) respectively. The bronchoscopic finding was purulent secretions in majority (43.6%). BAL Cb-naat for Tuberculosis was positive in 41.8% and sensitive to rifampicin in all patients.

Conclusions

The study showed the need for early referral and evaluation of non-resolving pneumonia patients. Bronchoscopy was found to be a valid investigation modality with a good diagnostic yield.

Keywords: cartridge-based nucleic acid amplification test;tuberculosis; video bronchoscopy.

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INTRODUCTION

Community acquired pneumonia (CAP) is one among many acute medical conditions that require hospitalisation. Majority of patients hospitalised with community acquired pneumonia respond well to standard antimicrobial therapy with an uncomplicated course while a minority fail to respond requiring further investigations and treatment.[1] Even with the advances in clinical care, the mortality rate with community acquired pneumonia remains around 5 to 15%.[1]

Non-resolving pneumonia refers to radiological abnormalities in community acquired pneumonia that are persistent beyond the expected period of time.[2] The incidence of non-resolving pneumonia in community-acquired pneumonia is approximately 10% to 25%. Mortality in non-responding pneumonia increases 3-fold in community-acquired pneumonia.[3] It accounts for approximately fifteen percentage of inpatient admissions in the department of pulmonary medicine and eight percentage of bronchoscopies performed.[4]

Multiple factors have been implicated in the aetiology of non-resolving pneumonia including advanced age, smoking, alcoholism, host immunity, virulence and microbial resistance of infecting organisms, underlying lung diseases and comorbidities like diabetes mellitus, HIV infection and other diseases mimicking pneumonia like tumors and non-infectious causes.[5] Many studies have shown age and male gender to be associated with the incidence of non-resolving pneumonia.[6,7]

Management of non responding patients requires a re-evaluation of the patients with invasive respiratory samples and radiographic studies. Despite non-resolving pneumonia causing far more mortality and morbidity, there is dearth of literature on its clinical, radiological features and bronchoscopic findings. This study analyses the clinical & radiological profile of the patients with non-resolving pneumonia and the diagnostic outcome of video bronchoscopy guided investigations.

METHODS

A hospital-based cross-sectional study conducted among patients admitted with non-resolving pneumonia in the department of respiratory medicine, Madras medical college, Chennai in the time period from August 2015 to July 2018 (3 years).

Non-resolving pneumonia is a "A clinical condition wherein radiological infiltrates (focal or diffuse, unilateral or bilateral, parenchymal or interstitial) begin with association of acute pulmonary infection and with a minimum of 10 days standard antimicrobial therapy, the clinical condition fails to improve /worsen or the radiological opacities fail to resolve by 50% at 2 weeks or less than complete clearing at 4 weeks".[8,9,10,11,12,13]

Patients admitted with non-resolving pneumonia were included in the study while patients with very poor general condition, very severe breathlessness, recent history of myocardial infarction, patients not fit for bronchoscopy, previous history of pulmonary tuberculosis and patients not willing to give consent were excluded form the study.

Among a total of 420 patients admitted with provisional diagnosis of pneumonia during the study period, 55 patients diagnosed with non-resolving pneumonia were enrolled in the study. The socio-demographic data of the patients was collected. Detailed clinical profile of the patients was collected. The clinical history included the presenting complaint/ symptom and its duration, history of smoking and alcoholism and presence of comorbidities. General examination with structured clinical

examination of respiratory system and other systems were done. Basic blood investigations were done followed by chest skiagram postero-anterior and lateral view. Plain computed tomography (CT) chest/contrast enhanced CT chest (CECT)/high resolution computed tomography chest (HRCT) as needed were done.

As per indication, video bronchoscopy was done in all patients. Bronchoalveolar lavage (BAL) from the involved lobe and its affected segment was done and the specimen obtained was sent for cartridge based nucleic acid amplification test ,AFB smear (acid fast bacilli smear), bacterial culture, cytology, cell count and fungal smear. During bronchoscopy, endobronchial biopsy and trans-bronchial lung biopsy if necessary were done. CT guided biopsy if necessary was done to diagnose the cause for non-resolving pneumonia. Statistical analysis was done using the SPSS software. Variables were presented as Frequency tables.

RESULTS

A total number of 55 patients who satisfied the inclusion and exclusion criteria were included in our study. The age of the patients ranged from 20 year to 69 years. The patients belonged to age groups <30 years, 31-40 years, 41-50 years, 51-60 years and >60 years were 10.9%, 10.9%, 23.6%, 38.2% and 16.4% respectively. Out of the total 55 patients, males accounted for 80% while females accounted for 20% (Table 1). Of all patients, majority 49.1% were illiterate (Figure 1). The gross total income of the family was less than or equal to 250 Rupees in 28 patients, 251-500 Rupees in 18 patients and 501-1000 Rupees in 9 patients (Table 2).

The symptom of majority of patients was cough with expectoration in 54.5% of patients followed by dyspnea, hemoptysis and chest pain (Table 3). 40% patients had symptom duration of >8 weeks while 22% patients had symptom duration of 6-8 weeks (Figure 2). Of all the patients, crackles was the most common auscultatory finding in 80%, wheeze in 14.5% and diminished breath sounds in 5.5% (figure 4). Computed tomography Chest showed left upper lobe involvement in 25.4%, right upper lobe in 21.8%, diffuse involvement in 21.8%, left lower lobe in 12.7%, right lower lobe in 10.9%, and right middle lobe in 7.3% (Figure 5).

The most common bronchoscopic finding was purulent secretions in 43.6%, mucosal inflammation in 38.2%, intraluminal mass/ granulation tissue in 9.1%, blood stained secretions in 5.5 and mucous plugging in 3.6%. BAL Cb-naat was positive, Mycobacterium Tuberculosis-detected in 41.8% and was sensitive to rifampicin in all patients, while BAL AFB smear was positive in 21.8%. BAL bacterial culture was contributory in arriving at a diagnosis in 14.5% of patients. The results of bacterial culture are shown in (Table 5). Endobronchial biopsy was done for 6 patients. Of which, 4 were positive for malignancy,1 for carcinoid tumor and 1 for fungal pneumonia (mucor). transbronchial lung biopsy (TBLB) was done in 3 patients, 1 case was diagnosed as bronchiolitis obliterans organizing pneumonia (BOOP), 1 as chronic hypersensitivity pneumonitis (HSP) (Bird fanciers lung) and 1 actinomycetes pneumonia. The bronchial wash cytology results showed 7 (12.7%) positive for malignancy. Ct guided biopsy was done in 4 patients, 3 cases were diagnosed as carcinoma and 1 as lipoid pneumonia (Table 5). On thorough clinical and radiological examination, 2 were diagnosed as allergic bronchopulmonary aspergillosis (ABPA), 3 were diagnosed as silicosis, 1 was diagnosed as systemic lupus erythematosus (SLE) pneumonitis and 1 was diagnosed to have diffuse alveolar hemorrhage (DAH) with pulmonary renal syndrome. 4 of the study participants were undiagnosed.

Table 1. Sociodemographic characteristics.			
Sociodemographic characteristic	**Frequency (n = 55)**	**Percentage**	
Age			Mean age 49.3 years
<30 years	6	10.9%	
31-40 years	6	10.9%,	
41-50 years	13	23.6%,	
51-60 years	21	38.2%	
>60 years	9	16.4%	
Gender			
Male	44	80%	
Female	11	20%	

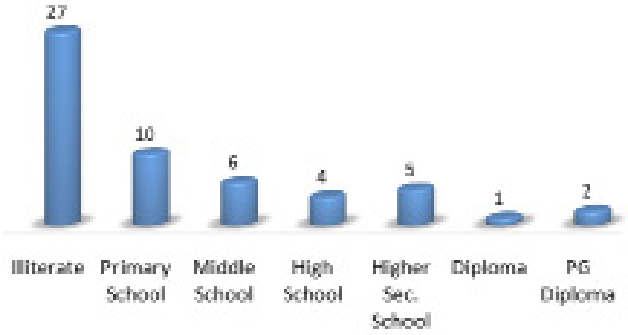

Figure 1. Educational status.

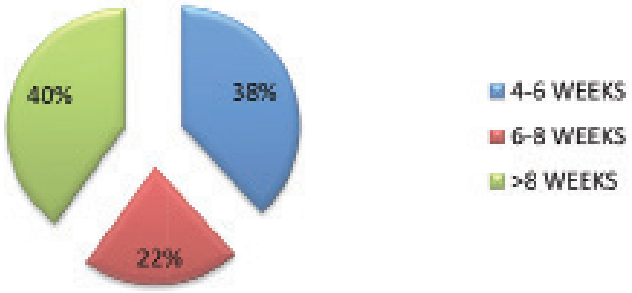

Figure 2. Duration of symptoms.

Table 2. Gross total income per day.		
Gross total income per day		
	Freq.	%
<=250	28	50.9
251 TO 500	18	32.7
501 TO 1000	9	16.4
Total	**55**	**100.0**

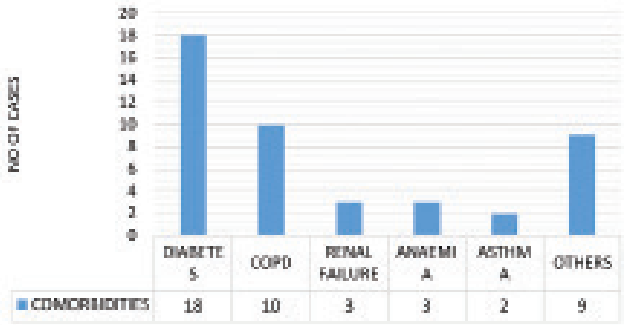

Figure 3. Comorbid illness.

Table 3. Clinical profile.		
Presenting symptoms		
	Freq.	%
dry cough	3	5.5
cough with expectoration	30	54.5
dyspnea	9	16.4
chest pain	4	7.3
hemoptysis	6	10.9
fever	3	5.5
Total	**55**	**100.0**

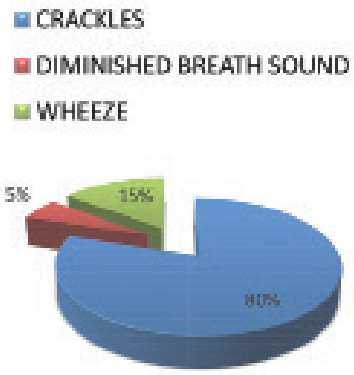

Figure 4. Auscultatory finding.

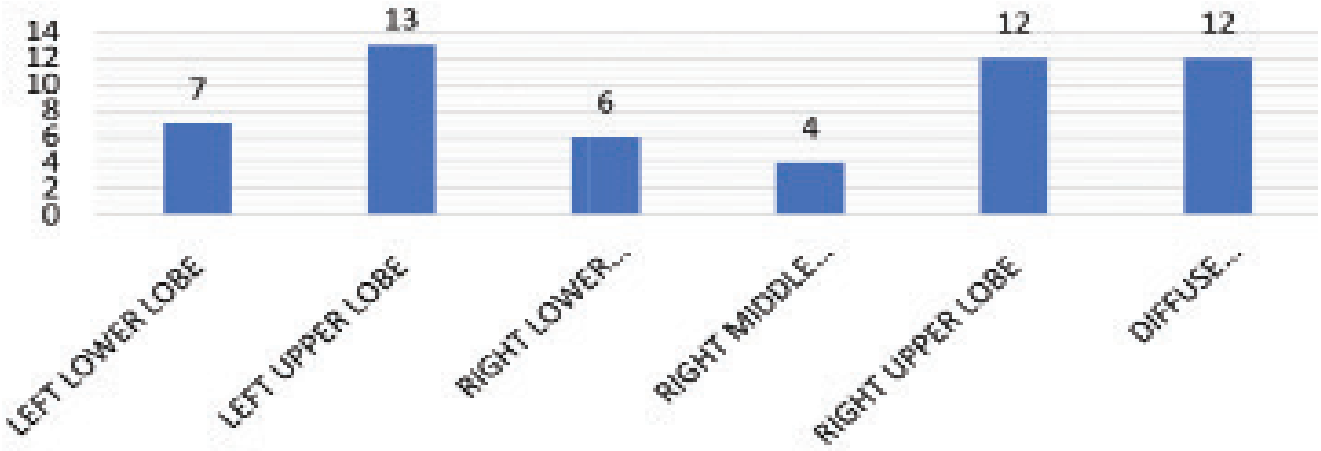

Figure 5. Lobes involved in ct chest.

Table 4. Diagnostic outcomes of BAL analysis/biopsy/clinic-radiological assessment.

	Investigation	Positive results (n)
Pulmonary tuberculosis	CB-NAAT	23
	AFB smear	12
Acinetobacter	Bacterial culture	1
E.coli	Bacterial culture	1
Klebsiella pneumoniae	Bacterial culture	1
Nocardia species	Bacterial culture	1
Pseudomonas aeruginosa	Bacterial culture	1
Proteus mirabilis	Bacterial culture	1
Proteus vulgaris	Bacterial culture	1
Actinomycetes	Bacterial culture	1
Carcinoma	Endobronchial biopsy	4
	CT guided biopsy	3
Carcinoid tumor	Endobronchial biopsy	1
Lipoid pneumonia	CT guided biopsy	1
Fungal pneumonia	Endobronchial biopsy	1
BOOP	Transbronchial lung biopsy	1
Chronic HSP	Clinical and transbronchial lung biopsy	1
Actinomycetes pneumonia	Transbronchial lung biopsy	1
Allergic bronchopulmonary aspergillosis (ABPA)	Clinical and radiological criteria	2
Silicosis	CT chest	3
SLE pneumonitis	Clinical criteria and radiological criteria	1
DAH with pulmonary renal syndrome	Clinical and radiological criteria	1
Undiagnosed		4

Table 5. Video bronchoscopic findings		
Bronchoscopy findings		
	Freq.	%
blood stained secretions	3	5.5
intraluminal granulation tissue/ mass	5	9.1
mucosal inflammation	21	38.2
mucous plugging	2	3.6
purulent secretions	24	43.6
Total	**55**	**100.0**

DISCUSSION

Among all the patients included in the study, majority belonged to 51-60 years age group. This was in concurrence with the study by Jayaprakash et al (64%) and Jain et al (65%). Of all the patients, 80% were males and 49.1% of subjects were illiterate. Similar to studies by Jain et al (73%) and Jayaprakash et al (68%), this study showed more male involvement than females. Majority of the studies failed to evaluate the other socio-demographics of the patients. The gross total income of the family per day was less than or equal to 250 Rupees in majority of patients[13,14] More than half of the patients presented with cough with expectoration followed by dyspnea. Studies by Jayaprakash et al, Chaudhuri et al and Vipparthi Surya kumari et al showed similar results. Majority of patients presented with symptoms for more than 8 weeks[6,13,15] Out of 55 patients in our study, 47.3% were smokers and 54.5% patients were alcohol consumers. This was the similar presentation in most studies. Diabetes was present in 40% and COPD in 22.22% similar to study by Chaudhuri and Jayaprakash.[6,13]

More than 75% of the patients presented with crackles as the auscultatory finding. This was not analysed in any of the studies in the past. On computed tomography chest, 25.4% had a predilection for left upper lobe involvement while right upper lobe and diffuse involvement again were both 21.8%. Many studies showed a predilection for Right lung involvement while our study showed left lung involvement.

In our study the most common bronchoscopic finding was purulent secretions in 43.6% followed by mucosal inflammation in 38.2%, intraluminal mass/granulation tissue in 9.1%, blood stained secretions in 5.5 and mucous plugging in 3.6%. This was in concurrence with the study by Ramesh et al which showed inflammation in 66% and intraluminal tissue in 13.3%.[7] Out of 55 patients, in our study BAL CB-NAAT had a result of mycobacterium tuberculosis detected in 41.8% while bronchial wash AFB smear was positive in 21.8%. This was similar to the study by Vipparthi Surya kumari which showed tuberculosis in 33% patients while other studies showed much lower presence of tuberculosis. This could be because of the incorporation of bronchial wash CB-NAAT in the diagnostic procedures.[15]

Bronchial wash bacterial culture was contributory in arriving at a diagnosis in 14.5% of patients. Among those patients, 1 was positive for acinetobacter, 1 for E.coli, 1 for klebsiella pneumoniae, 1 for nocardia species, 1 for pseudomonas aeruginosa, 1 for proteus mirabilis, 1 for proteus vulgaris and 1 for actinomycetes. The Bronchial wash cytology results showed 7(12.7%) positive for malignancy. Endobronchial biopsy was done for 6 patients. Of which, 4 positive for malignancy,1 for carcinoid tumor and 1 for fungal pneumonia (mucor). TBLB was done in 3 patients, 1 case was diagnosed as BOOP, 1 as chronic HSP (bird fanciers lung) and 1 actinomycetes pneumonia. CT-guided biopsy was done in 4 patients, 3 cases were diagnosed as carcinoma and 1 as lipoid pneumonia (Table 6 & 7). These results were similar to the studies by Chaudhuri et al and Jayaprakash et al. On thorough clinical and

radiological examination, 2 were diagnosed as allergic bronchopulmonary aspergillosis (ABPA), 3 were diagnosed as silicosis, 1 was diagnosed as SLE pneumonitis and 1 was diagnosed to have DAH with pulmonary renal syndrome. While, 4 of the study participants were undiagnosed.

CONCLUSIONS

Non-resolving pneumonia was observed to be more common in middle aged (>40 years) with the common presenting symptom cough with expectoration. Bronchoscopy was found to be a safe and useful procedure with a good diagnostic yield. Tuberculosis was the most common cause for non-resolving pneumonia and BAL CB-NAAT, as a single investigation showed an appreciable diagnostic yield.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee.

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